

Mark Scheme (Results) Summer 2007

GCE

GCE Geography (6471) Paper 1

6471 Summer 2007

Question 1

a) Study Fig 1a. It is a flow diagram of the river drainage basin system.

i) Identify: (3)

Output A	Evapotranspiration or transpiration, not evaporation
Transfer B	Percolation, accept percolation or similar spelling
Store C	Soil, soil moisture storage or soil storage

(3x 1 mark)

ii) Suggest 2 ways in which the system would change if some of the vegetation cover was removed in the drainage basin. (2)

Less interception, less evapo-transpiration, more evaporation especially from surface storage, more surface stores, maybe more groundwater due to increased infiltration and percolation, fewer stores above ground, more surface runoff, shorter lag-time.
Candidates may incorrectly confuse groundwater flow with surface runoff
Any two valid points, etc 1 mark each. Credit general idea of more water going down into the soil/rock with 1 mark

iii) Explain why groundwater often makes a greater contribution to river flow in the summer than it does in winter. (3)

Candidates may incorrectly confuse groundwater flow with surface runoff so some responses may be difficult to interpret.

- Role of base flow (= rate of discharge in a stream where only the throughflow and groundwater flow from subsurface aquifers contribute to overall flow) important here due to lower precipitation in summer.
- More evaporation in summer due to higher temperatures so proportionally more groundwater enters river
- In winter higher rainfall and saturated soil/frozen soil cause more water to go to river before it reaches groundwater stores.
- Less throughflow etc and overland flow in summer so base flow proportionally more important.
- Impact of seasonal changes in vegetation cover.

3 x 1 mark. Credit development and use of terms. Use of "base flow" not needed for 3 marks.

b) Study Fig 1b, it shows the soil moisture budget for Phoenix, Arizona in the USA.

i) Define the following terms:

Soil moisture surplus (2)
When precipitation exceeds (potential) evapotranspiration, accept when soil water stores are full and water available for plant use/runoff.

Must imply excess to gain credit.

General idea of more water than is needed can gain 1 mark.

Use of correct terminology or development of basic point will gain second mark. No credit for quoting information from the graph e.g. this is what happens in December and January, or for repeating words in the definition.

Soil moisture recharge (2)

When water is filling the pore spaces of the soil/when the soil moisture deficit is overcome by rainfall .

General idea of soil filling up/getting wetter gains 1 mark. Use of correct terminology or development of basic point will gain second mark. No credit for repeating words in the definition, eg “when the soil is recharged”

2 marks each definition

ii) For how many months does Phoenix have a soil moisture deficit? (1)
10 months (only accept 10)

iii) Suggest how the climate might be the cause of this soil moisture deficit . (2)

Large SMD implies a hot dry climate so high temperatures will cause evaporation. Low rainfall will mean the recharge is limited.

1 mark for high temperature and/or low rainfall (hot and dry), 2nd mark for extension and linkage to soil moisture.

iv) Use the graph to explain the likely implications for water management in the city of Phoenix and the surrounding area. You should consider farmers and city dwellers in your answer.

(5)

This question is about management of water resources for two groups of people.

Farmers

- Crops will require irrigation - expensive, needs managing carefully due to salinisation problems.
- Political pressure to provide water for farmers to secure a living/income.
- Possible issues for farmers if they have to give up land for water storage
- Possible conflict with city dwellers over water resources

City dwellers

- Issues of water supply, abstraction etc.
- May mention political pressure
- Hosepipe bans, water meters, increased water prices to reduce consumption
- Lifestyle of urban rich using large quantities of water.

Flooding in winter months may be a problem for both groups. Water transfer may be raised.

Credit reference to other locations with similar issues.

L3 5 marks	Mentions management issues for farmers and city dwellers. Uses graph (months or figures)
L2 3-4 marks	Some valid ideas showing some understanding of management issues. May be unbalanced and only concentrate on one group (3 marks)
L1 1-2 marks	Limited relevant knowledge on issue of water shortage. Limited suggestions e.g. everyone will have to have water meters.

c) With reference to one or more named examples show how bad river management can lead to disastrous consequences. (10)

Open question. Expect river and/or floodplain mismanagement, e.g. Colorado, Nile delta, Volta, Mississippi or smaller scale such as Lynmouth/Piddle

Disaster implies serious effects on people and environment/ecosystems.

People - displacement of people, short term and long term problems of flooding, living behind levees etc, cost of defences cost of damage, risk of disease due to standing water/contaminated drinking supplies, reduction in fishing/leisure income due to river management upstream, etc

Environment/ecosystems - displacement of habitats, clear water erosion from dams, flood risk downstream, navigation may be affected, low flow issues due to over abstraction affecting ecosystems etc

L3 9-10marks	Structured account of river mismanagement, clearly exemplified. Uses information and terminology competently.
L2 5-8 marks	Some description and explanation of river mismanagement. Examples lack depth and detail at lower end.
L1 1-4 marks	Descriptive, little or no use of named examples or relevant terminology. Tells the story of a flood with no reference to mismanagement.

Question 2

a) Study Figure 2. It shows satellite images of a section of the Jamuna River in Bangladesh.

i) Describe the main characteristics of the river channel in February. (3)

- Braiding/Split channels - 1 mark
- Many chars or islands or eyots - 1 mark
- One main channel with others off it/distributaries - 1 mark
- Some meandering and cut offs - 1 mark
- Relatively shallow. 1 mark
- Deposition overall 1 mark
- Credit use of scale - 1 mark
- 3x 1 mark No credit for comments about land use or tributaries

ii) Describe the changes to the channel between February and August. (3)

- All channels merged. 1 mark
- Wider channel/greater area covered in water. 1 mark
- Deeper water/Higher volume of water/ more water. 1 mark
- Flooding/cultivated land covered in shallow water. 1 mark
- Erosion in deeper water. 1 mark
- Chars/ islands disappeared or fewer islands 1 mark
- Credit use of scale - 1 mark

3x1 mark No credit for impact on land use/human activity

iii) Suggest reasons for these changes. (4)

This is primarily the result of seasonal change in discharge due to the monsoon, so issues such as deforestation or reasons for flooding are really not relevant. Heavy rainfall (monsoon) and snow melt causes saturation of ground water and soil stores, and increased overland flow. This causes channels to exceed bank full and merge, and for flooding to occur on surrounding floodplain. Credit detail on process when linked to channel change.

L3 4 marks	Clearly explains changes. Uses evidence and appropriate terminology. Links process to channel's characteristics.
L2 2-3 marks	Identifies and begins to explain some reasons for change. Max 2 if answer only focuses on reasons for flooding, not linked to season.
L1 1 mark	Limited or no explanation probably linked to more flooding.

iv) Suggest why the Bangladeshi people find it difficult to manage the Jamuna river with hard engineering. (4)

This question is testing application of knowledge about hard engineering to the resource material and the Jamuna River's characteristics, which have been identified by the candidate in the previous few questions.

Maximum 2 marks for an answer that relies solely on general geographical knowledge about Bangladesh.

General geographical knowledge about Bangladesh

- Low lying so prone to flooding
- Deforestation upstream in Nepal causes problems
- Monsoon rainfall may be variable
- LEDC/Bangladesh one of the poorest countries in the world
- Points from the Resource material or AS course**
- Constantly moving channel -hard to contain,
- Vast length of river to manage,
- Extent of flooding may mean levees etc have to be very high,
- Cost of construction
- Poor foundations for hard engineering, cost of maintenance,
- Huge changes in river discharge,
- Floodwater may get trapped behind levees,
- People may rely on flooding (cultivated land next to river suggests this may be the case)
- May have rising groundwater

4 x 1 mark. Credit development up to 2 marks per point including use of examples

b) Study the table below. It gives information about the percentage of Bangladeshi households affected by the impacts of flooding in 2002.

Use the data to suggest why the river makes life more precarious for the char dwellers than elsewhere in rural Bangladesh. (6)

- Floods and erosion cause disruption- damage or destroy crops and farmland
- Damage sanitation systems, homes, water storage etc.
- May be unemployed and landless.
- Can't pay for basic essentials such as food and healthcare.
- Poor sanitation/flooding will cause diarrhoea and water borne disease.
- Harder to get to clinics

L3 5-6 marks	Impacts of flooding clearly linked to life for char and non-char dwellers. Uses data effectively. Own knowledge evident.
L2 3-4 marks	Explains some impacts of flooding for char dwellers. Data used Lower end describes only.
L1 1-2 marks	Basic information about flooding/erosion. Simple statements. Descriptive. May just repeat data in table.

c) Using named examples examine the impact of one of the following on river environments

- Dams and reservoir construction
- Urbanisation
- Water quality

(10)

“River environments” includes the human and physical environment of the river and its floodplain so covers a range of aspects including the quality and quantity of the water itself and the use of this water, river and wetland ecosystems, floodplains etc

Examples can be from any scale but must be appropriate. Can be several locations along the same river or different rivers.

Dam and reservoir construction:

Regulation of flow, less sediment downstream, increased sedimentation upstream behind dam, changes to riverine ecosystems, fish migration, increase or decrease in flooding, impact on agriculture/irrigation/water supply/energy supply etc

Urbanisation:

Increase in sediment during construction, increase in impermeable surface produces faster runoff, channelisation and other hard engineering works, changes to riverside habitats, urban pollution etc

Water quality:

Improvements e.g. water treatment or deterioration due to sewage, industrial, agricultural pollution.

L3 9-10 marks	Structured, detailed account of several consequences. Well exemplified. May evaluate.
L2 5-8 marks	Satisfactory account linked to named river(s), some linkage to consequences. Lower end descriptive and generalised. Max 6 for a single location on one river.
L1 1-4 marks	Basic ideas, limited (e.g. names a river but no more detail) or no examples. Focuses on activities, not consequences.

Question 3

Study Figure 3. It is a map of the Christchurch area, South Island, New Zealand.

a) i) Using the map, identify features A and B.

A = braided channel/braid/braiding/eyot/ island(s)/estuary/ bar

B = spit/bar/barrier island

2 x 1 mark

(2)

ii) Suggest how one of the features identified in (a)(i) may have been formed. You may draw a diagram as part of your answer.

(4)

N. B. 3ai is clerically marked so the candidate's answer will be hidden. If they have incorrectly identified the feature in ai they will have been penalised. aii therefore needs to be marked as seen and incorrect ideas(e.g. tombolo, wetland, salt marsh, river mouth, sand dune, delta) should be credited unless they are clearly inappropriate in this context e.g. headland and bay coastline, river meander.

A. Braiding : Rivers carrying sediment load in times of flood/snow melt will drop load in channel, causing it to be split. This increased friction and encourages more deposition. Islands of silt/mud created.

B. Spit grows across bay, break in coastline. Longshore drift carries material along coast (credit detail on swash/backwash/wind direction, east to west etc). Detail on longshore drift must link to landform and not just the process per se.

Barrier island grown by longshore drift, by sand or shingle driven onshore by wave action (most likely on this coast, or by a combination of both processes.

Credit use of diagram and appropriate use of terminology. Credit development of points and reference to processes. 4x 1 mark.

iii) Suggest how a storm event may affect feature B.

(2)

May cause erosion and breaching near Tamutu, may bring more material onshore to build up spit, may create marshland as a result of floods, changes in salinity levels etc 2x1 sensible points. No credit for general "effects" eg "it will affect vegetation"

iv) Why has the delta formed at C?

(4)

River carries large load, deposited faster than it is removed. Lake has limited capacity to remove sediment due to little movement of water (weak current, small waves = low energy environment). River slows as it reaches lake. Deposition occurs. Sediment built up over time, shallow water. 4 x 1 valid mark.

Credit development up to 3 marks.

b) i) There are several wetland ecosystems on Figure 3. What is a wetland ecosystem? (2)

"Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface of the land is covered by shallow water". Cowardin et al 1979

2 marks for a sound definition of the term .

Credit 1 mark for idea of ecosystem in /around water .

May give examples e.g. estuary, floodplain, pond, marsh etc/location e.g. Everglades, or give details of species for second mark.

ii) For a named wetland ecosystem describe how you would undertake a fieldwork investigation of its structure.

(6)

- Likely to talk about pond/hydrosere:
- quadrat survey (not in a pond!) along a transect,
- Study vegetation/ percentage cover, height, type variety etc.
- Fall /catch traps for pond-side organisms, beating tray, tow nets/kick samples, observation of e.g. footprints etc
- May give details of sampling strategy.

L3 5-6 marks	Detailed description of fieldwork techniques appropriate to wetland ecosystem, to study abiotic or biotic elements. Uses terminology.
L2 3-4 marks	Some understanding. Describes techniques for ecosystem survey such as quadrats and insect counts, not necessarily related to wetlands.
L1 1-2 marks	Limited ideas, some may be inappropriate or generic e.g "I would study the plants in the area."

c) With reference to one named coastal ecosystem examine how it has been changed by either natural processes or human activities.

(10)

Expect psammoseres, but also coral and salt marshes.

If more than one ecosystem is tackled, or natural processes and human activities are tackled, mark both/all and credit best mark.

NB Located example not required but is likely in many cases and should be rewarded.

Natural change-succession, seral stage to climax, arresting factors e.g. wind, salt, water table. Indicators of change- plants

Human activities -trampling, blowouts, fire, management such as clearance/fencing off areas pollution-noise, air, etc

L3 9-10 marks	Structured account well focused on change to ecosystem. May evaluate Uses examples and terminology.
L2 5-8 marks	Some knowledge and understanding of how and why coastal ecosystem changes. Less exemplification. Some use of terms.
L1 1-4 marks	One or two changes identified, no exemplification e.g. plants get trampled and die.

Question 4

a) Study Figure 4a. The photograph shows how the Scottish coastline has been affected by both long-term changes in sea level and present day processes.

- i) Identify coastal features X and Y. (2)
X = Raised beach/fossil beach/ relict beach/ previous beach/ old beach old wavecut platform / (not just beach)

Y = Fossil cliff/relict cliff/ previous cliff (not just cliff)

- ii) Explain how changes in sea level have created features X and Y. (3)

Isostatic recovery of land after depression in glacial times.
Eustatic fall in sea level after interglacial
Cliffs were made when sea level was higher.
Sea level fallen in relation to land so beach and cliffs left high and dry.
3x 1 mark for logical explanation. Credit use of terminology and examples but must be of named places, not "The Scottish coastline" as in the title of the resource.

- iii) How might the river at Z affect the sediment in the bay? (3)

Sediment brought on coast by river.
Sediments finer due to sorting by river,
Delta/estuary-like feature may be formed,
May provide sediment for longshore drift and new coastal landforms eg spit
Different habitats,
Created a channel across beach
Can be tackled various ways. Credit relevant point with further mark for development or three different points.

- iv) What might be the impacts of increased human activity on this landscape? (3)

Question is about **impact**, not **use** of the coast so trampling of vegetation is an acceptable answer but walking is not.

Pollution of landscape-visual from buildings, pylons, turbines, roads, litter etc
air from increased traffic,
Ecosystems under threat eg deforestation
Changes to sediment load and river flow due to deforestation
Changing farming practices may affect water quality, ecosystems etc,
Changes to sediment cells etc if coast is changed by e.g. jetty
Economic development leading to changes in local hydrology
May trigger conservation measures, etc
Accept any plausible ideas, but not sea defences. 1 mark per idea, 2 for development.

- v) In what ways can decision makers ensure that landscapes like this one are protected? (3)

Range of appropriate answers:
SMPs, Heritage Coast status, National Park, National Trust, integrated management, protected status e.g. SSSI, planning, land use zoning, exclusion of public, creation of honey pot elsewhere etc
1 mark per idea with second for development.
Credit plausible ideas on protection and sustainable development to max 2.

Max 2 marks for details on micro- management e.g. fencing, signposts, foot paths etc or special designation eg National Park, SSSI, heritage coast, NP, NT and AONB.

No credit for installing sea defences such as sea walls

b) Study Figure 4(b). It is a sketch cross section of the beach below point X . Describe and explain how present day coastal processes may have formed this beach profile.

(6)

Largest materials above HWM, storm ridge, berms, with some large stones and boulders.

Finer material nearer water's edge.

Distinct high tide mark.

Steeper profile where beach material is larger etc

Material deposited onshore, larger particles deposited in higher energy conditions e.g. storms, backwash percolates so larger particles remain, High spring tides create berms and storm beaches, expect details of wave action, constructive waves etc.

Attrition rounds off beach material

Increased frequency of storms, may change high tide position.

L3 5-6 marks	Clear linkage between process and features. Confident use of terminology.
L2 3-4 marks	Some aspects of profile described. Begins to link process and feature for 4 marks
L1 1-2 marks	Simple description of profile. Basic idea of process.

c) With reference to a named stretch of coastline examine how physical factors have affected coastal features.

(10)

A stretch of coast line implies a number of locations along a coast or one site which displays several coastal features.

Coastline must be named and features located.

Accept a variety of erosional and depositional features, including sand dunes.

Expect details on geology, lithology, marine factors such as wave energy, longshore drift, mass movement, sub aerial processes, climatic factors e.g. wind, temperature affecting weathering etc, tectonics. May draw diagram.

Beware rubric error of human features/activities on coastline

L3 9-10 marks	Structured, account of the effect of several physical factors on named coastline. Details of location(s). Good knowledge of landforms Uses terminology confidently.
L2 5-8 marks	Some understanding of physical factors, lower end short on detail of location and specific factors.
L1 1-4 marks	One or two ideas about rocks or waves, some description of landforms. Lacks linkage to factors or location.

5 a) Study Figure 5a, it shows a recent landslide on a chalk cliff.

i) The following processes are at work on these cliffs:
 salt weathering; hydraulic action; abrasion; freeze-thaw
 Put them into the correct place in the table below:

CLIFF-FOOT PROCESSES	CLIFF-FACE PROCESSES
Abrasion Hydraulic action	Salt weathering Freeze -thaw

(4)

ii) Explain how cliff-foot and cliff-face processes combine to cause the cliff collapse. (6)

Abrasion causing undermining, forming a notch. This allows rock falls to occur.
 Hydraulic action weakens rocks by attacking joints and bedding planes. These may also be attacked by sub aerial processes.
 Corrosion will occur at cliff foot and on cliff face.
 Biological weathering will occur on cliff face and at base.
 Corrosion/Abrasion occurs using eroded material.
 Do not credit information on slumps and mudflows.

L3 5-6 marks	Clear explanation linking processes to cliff collapse. Good use of terminology. Shows how cliff foot and cliff face processes work together.
L2 3-4 marks	Description of processes, begins to explain. May be unbalanced(cliff foot or cliff face processes only) or have very narrow range of processes.
L1 1-2 marks	Basic ideas e.g. waves attack cliff and break bits off.

b) Study Figure 5(b). It shows a stretch of the Dorset coastline.

i) This coastline shows differential erosion. Explain how this may have occurred. (3)

Bands of rock on concordant coastline. Harder rock e.g. chalk more resistant to marine erosion than softer rock, which has formed bays. Harder rock sticking up out of water.

Many answers will go beyond 3 marks

L3 - 3 marks	Variations in geology linked to <u>this</u> coastline eg may refer to landforms (headlands and bays) in the photograph or geology eg chalk/limestone
L2 - 2 marks	Identifies difference due to geology/lithology
L1 - 1 mark	Simple understanding of hard and soft rock.

ii) Suggest how and why this stretch of cliff top is being actively managed. (4)

Coastline being managed due to high numbers of visitors and variety of groups who use the coast. May mention need to protect landscape etc.
 Walkers may cause erosion of footpaths, walkers may disturb grazing animals, use of fertiliser by farmers may change ecosystem-, and coastal managers may restrict access, etc

Being managed by footpaths, fencing, probably an SMP, local council monitoring activity etc

Must mention how and why for full marks.

2x 2 developed points or 4 x 1 mark.

- iii) This location is a popular fieldwork site for A level geography students. Identify the potential hazards of undertaking fieldwork here and suggest possible ways of minimising them.

(3)

Hazard-fall down steep slope- ensure footing is secure, twisted ankle, wear boots, teachers brief students about environment prior to visit, drowning, falling rocks etc

1 mark for identifying hazards, 2 marks for methods of minimising the hazards or 2 marks for identifying hazards, 1 marks for method of minimising the hazards, **hazards and minimising must be linked**, must relate to **fieldwork** rather than more general detail on better steps, handrails, fences etc

Max 2 for list

- C) Referring to named examples, evaluate the success of management schemes in dealing with coastal erosion.

(10)

“Evaluate” implies weighing up, tackling costs/benefits commenting on effectiveness etc.

Wide question. May comment on more traditional schemes e.g. Mappleton, Barton, or look at a larger stretch of coastline such as the Holderness coast or the Purbeck coast. Expect some candidates to give detail on sustainable schemes.

L3 9-10 marks	Structured account of management scheme(s) at one or more coastal location. Clear evaluation. Expect use of place names and location detail, terminology.
L2 5-8 marks	Some knowledge and understanding of methods of defence and how they work but tends to be descriptive. Begins to evaluate at top end. Lower end lacks locational detail.
L1 1-4 marks	One to two defences described. Limited or no exemplification.